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April 27, 1999

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**APR 28 1999**

**FCC MAIL ROOM**

Ms. Magalie Roman Salas  
Office of the Secretary  
Federal Communications Commission  
The Portals  
445 Twelfth Street, S.W.  
12<sup>th</sup> Street Lobby, TW-A325  
Washington, D.C. 20024

Re: Ex Parte Presentation  
CC Docket No. 94-102

Dear Ms. Salas:

Attached is an expert opinion letter, dated April 26, 1999, from Giordano Automation Corp. concerning the degree of difficulty, cost, time required to implement and related factors pertaining to the development and deployment of handset software for Strongest Signal, Strongest/Adequate Signal and Strongest/Adequate Signal with adjustable threshold. Please note that the estimated per handset costs are based on amortizing the entire expense in one year even though the useful life of this software is expected to be five years or more. We understand that Giordano used one year because that time period is the customary and usual time period for expensing software.

Please let us know if you have any questions.

Sincerely,

  
Carl Hilliard

Enc.

cc w/enc. :

Ms. Karen Brown, Chief of Staff, Chairman Kennard  
Mr. Ari Fitzgerald, Legal Assistant to Chairman Kennard  
Mr. Paul Misner, Chief of Staff and Legal Assistant to Commissioner Furchtgott-Roth  
Mr. Dan Connors, Legal Assistant to Commissioner Ness  
Mr. Peter Tenhula, Legal Assistant to Commissioner Powell  
Ms. Karen Gulick, Legal Assistant to Commissioner Tristani  
Mr. Thomas Sugrue, Chief, Wireless Telecommunications Bureau  
Mr. Jim Schlichting, Deputy Chief, Wireless Telecommunications Bureau  
Mr. John Cimko, Chief, Policy Division, Wireless Telecommunications Bureau  
Mr. Dan Grosh, Special Counsel, Policy Division, Wireless Telecommunications Bureau  
Mr. Dale Hatfield, Chief, Office of Engineering and Technology

# GIORDANO AUTOMATION CORP.

April 26, 1999

## Opinion On Implementation of 911 call in Analog Cellular Systems

The Wireless Consumers Alliance has asked Giordano Automation Corp. to write an opinion to compare the implementation of "Strongest Signal", "Strongest/Adequate Signal" and the "Strongest/Adequate Signal with Adjustable Threshold Level", for 911 calls in any wireless station in an analog mode.

Giordano Automation is an internationally recognized small business corporation whose primary focus is providing high technology innovative systems and software solutions to commercial, aerospace, telecommunication and government customers. In view of a downturn in military business, the Company pursued a rapid conversion to commercial business through productization and sales of a commercial tool set implementing model-based diagnostic reasoning technology. They have also diversified into communication electronic hardware/software design and application program development. The Application Engineering Division personnel have over 40 years of experience in the commercial and military communication electronics business.

In this paper we will discuss the following for each proposal:

1. Mechanics of the software modifications and the degree of difficulty.
2. The time required implementing the modifications.
3. Cost to modify the handset.
4. The education to the customer required effecting this implementation.

**"Strongest/Adequate Signal"** will upon initiation of a 911 call, cause the handset to scan the 21 Forward Control Channels on the "Preferred" system and select the strongest signal. It then compares the signal level of the strongest channel to the minimum signal threshold, -80 dBm. If the level is not greater than or equal to this minimum threshold, the handset will scan all 42-control channels and select the strongest channel. The handset will initiate the "Call Origination" process. The MTSO will assign a voice channel and SAT for use during the call. The handset tunes to the assigned voice channel and listens for the appropriate SAT from the base station. If the handset receives the SAT in the required time limit, the handset responds with the SAT and the audio path is established. The base station must detect the returning SAT and enable the audio path. Via the PSTN, the system makes the call to the PSAP. This modification will fall under the following sections of EIA/TIA-553:

- 2.6.1 Initialization
- 2.6.2 Idle Task
- 2.6.2.4 Call Initiation
- 2.6.3 System Access
- 2.6.3.2 Scan Access Channels
- 2.6.4.4 Conversation

The ramifications to the software are minimal. We must add or modify approximately 25 lines of assembler code. This equates to approximately 75 to 100 bytes of code. The code to scan the access channel and acquire control channel is already looking for the two strongest signals in the "preferred" system. When it enters this area, it clears the channel and RSSI levels. It then scans the 21 control channels and saves the two strongest signals. At this point, we need to compare the value to -80 dBm. If it is less than this value, continue scanning the remaining 21 channels, but do not clear the channel or RSSI array. This way the strongest two signals across all 42 channels will be saved. The handset is ready to make the call. The handset will have the strongest signal either greater than or equal to -80 dBm on the "preferred" system or the strongest signal across all 42 channels. The time required for implementing the changes fall into four phases: Analysis, Modification, Testing and Installation. The software engineer will require time to analyze the source code to determine the exact location to effect the changes.

The cost to implement per handset is complicated. More than 10 million new analog and multi-mode mobile stations with analog capability are expected to be manufactured in the year 2000. There are 10 to 12 handset designs, all with different firmware. Each cellular telephone design has developed code that is unique to their design. To further compound the situation, 90% of the mobile stations are assembled by 6 or 7 manufacturers. Software engineering services vary throughout the industry. We chose to use \$125/man-hour as an average labor rate. These facts are factored into the cost analysis to yield a cumulative cost estimate for the implementation that will cover the entire industry.

The estimated cost to analyze the code is \$60,000.00. The modification plan must be defined and code changes implemented. This will cost approximately \$37,500.00. Code testing will cost about \$240,000.00. This cost includes any rework due to errors. The final phase, installation, will require the manufacturer to get involved. Most manufacturers can implement the changes within two months from receipt of the new firmware file. They will need to modify the production test process. This will require another month or two to implement. The estimated manufacturing cost is \$224,000.00. The total time to implement the changes will be less than six months and the total estimated cost is \$561,000.00. The cost per handset will be \$0.06.

**"Strongest Signal"** upon initiation of a 911 call, causes the handset to search all 42-control channels. It will lock on the strongest signal. The changes to the software will require modification or addition of 20 lines of code. The estimated cost for the analysis is \$60,000.00. Modifying the code will cost approximately \$30,000.00 and testing will cost \$240,000.00. The estimated cost to implement the changes is \$554,000.00. This includes the cost to the manufacturer. The cost per handset is approximately \$0.06.

**"Strongest/Adequate Signal with Adjustable Threshold Level"** is similar to strongest/adequate signal but it adds the option for the consumer to change the threshold. We must add or modify approximately 25 lines of assembler code. This equates to approximately 75 to 100 bytes of code. We must add or modify an additional 100 to 200 lines of code, 300 to 600 bytes, if the minimum signal threshold is to be programmable by the user.

**"Strongest/Adequate Signal with Adjustable Threshold Level"** requires the manufacturer to educate the customer. The cellular telephone manufacturers need to update their operator's manual. If the minimum signal threshold for 911 is to be preset by the user, they need to know where and how to do it. They also need to know what the values are that they are changing. The average consumer does not know what dBm means and what the affect of raising or lowering the reference level will do. They need to be informed that if they choose to lower the level from -80 dBm to -100 dBm, they will most likely find a signal on their "preferred" system but it will not be as reliable. The manufacturers must explain thoroughly and in plain language what are all of the ramifications of changing the threshold level. This will add to the cost of implementation. This is approximately \$250,000 for 10 million handsets, or \$0.03/handset.

If the technical writer does not adequately explain the cause and effect of changing the signal level and the user makes a mistake, the user will run the risk of not being able to connect to the PSAP. There is no need to explain the outcome of this type of situation. To the average consumer, having this ability to reprogram thresholds will only complicate the situation since changing levels by hand will not improve their ability to make a 911 call. On the contrary, it may hinder it. The idea of automatically searching for the strongest signal across the 42-control channels has a high probability of establishing a 911 call if the signal strength is greater than or equal to -80dBm. However, if the signal strength is less than -80dBm, a connection may be inconsistent. Therefore, it is not feasible to let the consumer change thresholds if it will not improve the chances of making a 911 call.


The code analysis will require \$120,000.00, the cost of code modification will be approximately \$240,000.00 and code testing is \$360,000.00. The total cost (including \$224,000.00 manufacturing cost) is \$944,000.00. The cost per handset will be \$0.09. The total cost to implement **"Strongest/Adequate Signal with Adjustable Threshold Level"** after factoring in software, manufacturing and documentation costs, is \$0.12/handset.


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A tabulation of the above cumulative cost analysis follows:

	Strongest/Adequate Signal with Adjustable Threshold Level	Strongest/Adequate Signal	Strongest Signal
Lines of Code	160	25	20
Bytes of Code	480	75	60
Code Analysis	\$120,000.00	\$60,000.00	\$60,000.00
Code Mod.	\$240,000.00	\$37,500.00	\$30,000.00
Code Testing	\$360,000.00	\$240,000.00	\$240,000.00
Manufacturing	\$224,000.00	\$224,000.00	\$224,000.00
Documentation	\$250,000.00	\$0.00	\$0.00
Total	\$1,194,000.00	\$561,500.00	\$554,000.00
Cost/Handset	\$0.12	\$0.06	\$0.06

Prepared by:

  
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